THE REPERTORY OF ARTS, MANUFACTURES, AND AGRICULTURE.

Consisting of

ORIGINAL COMMUNICATIONS,

SPECIFICATIONS OF PATENT INVENTIONS,

PRACTICAL AND INTERESTING PAPERS,

SELECTED FROM

THE PHILOSOPHICAL TRANSACTIONS AND SCIENTIFIC JOURNALS OF ALL NATIONS.

MONTHLY INTELLIGENCE

RELATING TO

THE USEFUL ARTS,

PROCEEDINGS OF LEARNED SOCIETIES,

AND

NOTICES OF ALL PATENTS GRANTED FOR INVENTIONS.

VOLUME IV.—SECOND SERIES.

London:

PRINTED FOR J. WYATT,

REPERTORY - OFFICE, HATTON - GARDEN.

1804.

NICHOLS and SON Printers,
Red Lion Paſſage, Fleet Street.

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THE

REPERTORY

OF

ARTS, MANUFACTURES,

AND

AGRICULTURE.

NUMBER XXIV. SECOND SERIES. May 1, 1804.

Specification of the Patent granted to WILLIAM HYDE WOLLASTON, *of Buckingham-street, in the County of Middlesex, Gentleman; for an Improvement in Spectacles, by the Application of Concavo-convex Glasses to them.* Dated February 9, 1804.

With an Engraving.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said William Hyde Wollaston do hereby particularly describe and ascertain the nature of my said invention, and in what manner the same is to be performed, as follows; that is to say: The object of my said invention is to remedy the following defect, which has been observed in spectacles heretofore in use, *viz.* that no objects appear distinct through them but such as are seen through the centre of the glasses, or nearly so, but are indistinct in proportion to the distance of the part of the glass through which they are seen from the centre, whether

whether sidewise or upwards or downwards; that is to say, the indistinctness is greater in proportion as the rays of light passing from an object to the eye pass more obliquely through the glass, as is represented by the lines E, O, in Figs. 1 and 2, (Plate XVI.) in which E is the place of the eye, and A O in each is a section of a spectacle-glass, of the common defective construction. I have found that the defect above mentioned may be remedied by means unnoticed by the best practical opticians, and contrary to the opinion of the most celebrated writers on optical subjects.

Having observed that the portion of any glass employed in any one position of the eye is small, I perceived that by making the substance of a glass curved in the manner of a hollow globe, each portion of it might be situated nearly at right angles to the direction of the sight, and would thereby render lateral objects distinct without impairing the distinctness at the centre. My invention therefore consists in the application of this principle to spectacles; and my method of doing so is by having the glasses thereof of a form not heretofore used for that purpose; and the form of the said glasses is such, that the outer surface of each glass, or that which is farthest from the eye, is spherically convex, and the inner surface of the same glass, or that which is nearest to the eye, is spherically concave. A section of this form of glass, as represented by the drawing, Fig. 3, is adapted for a short-sighted person, having the interior and concave surface of each glass more curved than the exterior and convex surface of the same glass, by which the rays of light passing through the same are diverged, and the degree of curvature of the interior and concave surface is to be increased in proportion as the person to use the glasses is the more short-sighted.

For

For long-sighted persons, the form of each glass must be such as to have the exterior and convex surface thereof more curved than the interior and concave surface of the same glass, as is represented by a section of the said form of glass in the drawing Fig. 4, by which the rays of light passing through the same are converged; and the degree of curvature of the exterior and convex surface of the glass is to be increased in proportion as the person to use the glass is more long-sighted.

The methods of preparing such glasses, and of proportioning their curvature, so as to give them any power of magnifying or diminishing that may be required, and to suit the different sights of long and short-sighted persons, are too well known to persons skilled in optics to need any description.

In witness whereof, &c.

Specification of the Patent granted to JAMES BENNET, *of Oldham-street, Manchester, in the County Palatine of Lancaster, Manufacturer; for a Method of felting Woollen Cloth, and also of felting Cloth manufactured of Sheep's Wool, and other combined Materials.*

Dated March 10, 1803.

TO all to whom these presents shall come, &c. NOW KNOW YE, that the following is the nature of my said invention, and the mode, method, and manner in which the same is to be performed, used, and put in practice; that is to say: After such cloth has been manufactured by the weaver, and the same has gone through the usual regular processes of cutting, scouring, and cleansing, or such of them as the particular manufacture may require,

it must be immersed in hot water, a little below the boiling-point, and remain in that state till it has imbibed a moderate warmth. It must then be taken out, and laid on a large polished flagged stone; which stone must be placed on a frame, having a roller at each end, for the purpose of receiving the cloth, which must be wound tight over one of such rollers, the flag-stone having been previously heated pretty warm by means of pouring hot water on it. One end of such piece of cloth must then be drawn tight over the surface of the stone, and fixed to the roller at the other end; when so fixed, hot water, a little below the boiling point, must be poured on such cloth as it lies on the stone; and the surface of such cloth must then be rubbed or worked in that state with a polished marble, or some other hard body having a polished surface, by hand or with machinery, with a light pressure, until the workman perceives a stiffness in the friction, which will be produced by the marble, or other polished body, working the water off until the cloth becomes nearly dry; when the same process of pouring the hot water on the cloth, and expelling it again by friction, must be repeated until the felt required be produced; which processes will produce a felt, and cause the body of the cloth to unite in a sound substance. The above method may be used either with or without soap; the latter mode being found most beneficial to the substance of the cloth, and causing it to take the felt more expeditiously, is therefore recommended to be preferred. The cloth may then be dyed and finished to any colour, at the discretion of the manufacturer.

In witness whereof, &c.

Specification

Specification of the Patent granted to Marcus Hymans, *of Exeter-street, Covent Garden, in the County of Middlesex; for a Composition for Shaving without the Use of Razor, Soap, or Water.*

Dated February 7, 1804.

To all to whom these presents shall come, &c. Now know ye, that in compliance with the said proviso, I the said Marcus Hymans do hereby declare, that the said composition for shaving, as aforesaid, is prepared and used in the manner following; that is to say: Mix one pint and an half of clear lime-water, two ounces of gum-arabic, an half of an ounce of isinglass, an eighth of an ounce of cochineal, a quarter of an ounce of turmeric-root (made into powder), an eighth of an ounce of roach allum, an eighth of an ounce of salt of tartar, and an eighth of an ounce of cream of tartar, together; boil them for one hour at least, (stirring up the mixture during the whole time of boiling, and being careful not to let it boil over,) clear it through a sieve; then add two pounds and an half of iron pumice-stone, finely pulverized; mix the whole together, with the hands, into one cake, by the assistance of the white of two eggs, well stirred up. Then divide the cake, so made, into twelve smaller cakes; dry them in the open air for three days; put them into an oven of moderate heat for twenty-four hours, when they will be completely dry and fit for use. Apply them with a gentle friction to the beard, and they will produce the complete effect of shaving.

In witness whereof, &c.

Specification of the Patent granted to GEORGE MEDHURST, *of Battle-Bridge, in the Parish of St. James, Clerkenwell, Engineer; for a condensing Wind-Engine, capable of being applied to all Kinds of Purposes in which either Steam, Wind, Water, or Horses are used.*

Dated February 28, 1799.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said George Medhurst do hereby declare that the nature of my said invention is described in the drawings hereunto annexed, and in the manner following: First, I condense the air of the atmosphere (by machinery to be described hereafter) in a strong and close vessel, which I call the magazine, by means of a windmill, so as to make it from ten to twenty times more dense than it is in its natural state. Secondly, I conduct that dense air from the magazine through a pipe to the top of a cylinder, where it acts upon a piston, by its elasticity, without the aid of fire, and by these means keeps the machine in constant motion for a time, proportioned to the capacity of the magazine, though the wind do not blow. The object of my invention is to accumulate and preserve the irregular power which the wind produces, so that it may be applied to machinery to produce an uniform and regular motion whenever it is wanted. The windmill sails I construct in the usual vertical manner; or when a greater power is required than can be obtained in that manner, I construct them as follows. A broad ring or hoop of wood or metal B B B B Fig. 1, (Plate XV.) is fixed upon the extremity of the Arms C C C C, having a smaller one A A A A concentral with it, and of such diameter as to include about one-

one-half of the space included by the first. The two rings are supported by the arms C C C C, which extend from the axis to the outer ring, and against the wind by rods of metal, from the extremity of the axis continued out beyond the plane of the sails for that purpose. The sails are fixed between the rings A and B sufficient in number and size to fill nearly the whole of that space, leaving it open within the smaller one to allow the wind a free passage.

To apply my machinery to a windmill previously built, I fix a wheel B, Fig. 2, upon the upright shaft of the mill, which turns another wheel C fixed upon an horizontal one. Upon the rim of this wheel, as at D, is a strong pin, which takes hold of the end of the rod D D, the other end of which is jointed into the piece of timber E E; and on the lower end of this piece is an iron wheel, without teeth, to run upon the inclining plane F, which plane is set at a greater or less angle by means of the screw F G. The upper end of the piece E E is jointed into the beam H, which turns upon a fixed centre at I, and is jointed, at the other end, to the rod of the condensing piston L, which works in the barrel M, and to this barrel is screwed the pipe N, which leads to the magazine placed without the building, or under ground, as most convenient. There are two valves, P P, at the bottom of the barrel; one to admit the air into the barrel from the atmosphere, when the piston ascends, and the other to admit the air from the barrel to the magazine, when condensed by the descent of the piston. As the wheel C is turned round, it draws the rod D D, by the pin D, which drives the wheel E up and down the inclining plane, whereby the end of the beam H is made to rise and fall, and to work the piston-rod at the other end.

By

By means of the inclining plane and screw, the condensing piston is made to work a long or a short stroke, according to the strength of the wind, and the density of the air in the magazine. When the wind is strong, or the air in the magazine not much condensed, the inclining plane is to be set at a great angle, that the piston may make a long stroke, and drive into the magazine a greater quantity of air; but when the wind is weak, or the air in the magazine strongly condensed, the inclining plane must be set at a less angle, but which, of course, should be the greatest at which it will work. By these means, the full effect of the least wind will be obtained, as well as of the greatest; and, in consequence of the wheel at the end of the piece E E being drawn up to that point F, on which the inclining plane turns, the condensing piston will go to the bottom of the barrel every stroke, whether the angle is great or small.

To raise and depress the inclining plane, as occasion requires, I construct a regulator as follows:

The horizontal wheel *a*, is fixed upon the iron spindle *a a*, and is turned by the wheel B; and upon two round parts, near the bottom of the spindle *a a*, are placed two mitre wheels, X and W, which have each of them round holes in their centres, that the spindle *a a* may turn round within them, while they remain stationary. The teeth of each of these wheels work in the teeth of another vertical wheel Y, fixed upon the end of the long spindle Y N; and upon the other end is fixed the wheel N, the teeth of which work in the teeth of the wheel O, and this last wheel is fixed upon the nut of the screw G; so that whenever the wheel O is turned round either way, the screw G, with the inclining plane, is either raised or depressed. That part of the spindle *a a*, that is between the wheels X and W, is square, and has upon it a

coupling

coupling-box V, made to slide up and down between the wheels; this coupling-box is connected, by the rod L, to a centrifugal regulator, made in the usual manner, and kept in constant motion by the spindle *a a*. As the balls of the regulator are thrown farther from their centre of motion, by the increased velocity of the windmill, the coupling-box V will be drawn up by the rod L, so as to take hold of the wheel X, and cause that wheel to turn round with the spindle *a a*, whereby the wheel O, with the nut of the screw, will be turned, and the angle of the inclining plane increased. But when the velocity of the windmill is so small, that the balls of the regulator fall close in, the coupling-box V will be let down, so as to let go its hold of the wheel X, and take hold of the wheel W, whereby the wheel O, with the nut, will be turned the contrary way, and the inclining plane set at a less angle. By this means, the engine will adjust the inclining plane, so that the quantity of air driven into the magazine will always be the greatest that the strength of the wind, and the charge of the magazine, can admit of.

When the windmill is erected for the purpose of a condensing wind-engine, and the situation and circumstances permit, instead of the upright central shaft A, and wheels B and C, I make a cast-iron crank upon the middle of the axis of the sails, as *a*, Fig. 3; to this crank a rod is attached, which reaches to the lower part of the building, and takes hold of and turns in a socket at the end of the cast-iron piece *e f e*; this piece turns upon a fixed centre at *f*, and to the lower end of it is jointed the rod D, which moves the wheel upon the inclining plane, as described in Fig. 2; and I apply the regulator to this machinery by means of a small fly-wheel and crank, communicating by a rod to the lower end of the

 the

the piece *e f e*. Q, Fig. 2, is the pipe through which the dense air passes from the magazine to the cylinder R, which is either closed at top and bottom, and has a cylindrical rod and stuffing-box, as is usual in steam-engines, with a joint and roller at *q*, to keep it parallel, or is open at bottom, and is connected, by the rod under the piston, to the frame S S, as represented in the figure. The cylindrical rod, or the frame S S, is jointed to the end of the beam T, which turns upon a fixed centre at W, and to the other end of it is jointed the heavy iron rod W, which is connected to the crank of the fly-wheel Z; to this end of the beam also the pump-rods are connected, when the engine is applied to raise water: or, instead of applying the rod W immediately to the crank, I connect the end of it to the two short pieces B B, Fig. 4, one of which turns upon a fixed and firm pin at C, and the other is jointed to the rod D, which rod is connected to the crank, and by this means the fly-wheel receives a double velocity. There are two valves at the top of the cylinder R, Fig. 2, to be opened and shut by the engines, one to admit the air from the magazine into the cylinder, and the other to let the air out of the cylinder, when the piston is driven to the bottom. In consequence of the air in the magazine being at different times of various degrees of density, the valve that admits the air from the magazine must be shut, when the piston, in its descent, is at different distances from the top of the cylinder, that the quantity of force which the piston receives, in the whole descent, may be equal, although the density of the air is different; and this is to be managed by placing the sliding rod, that shuts the valve, higher or lower, on the frame S S, and may be made to adjust itself by a regulator.

Fig.

Fig. 5 represents an air-vessel and piston, by which a rotary motion is obtained without valves, applicable to small engines, or where a fly-wheel cannot be admitted; A C E D B is a section of the vessel, made of cast-iron, having a curve, superficies, and flat ends. In the inside of the vessel, and round the curve, runs a flat spiral division, fixed to the curve, and close to the boss of the axis O P; this spiral passes round from A to B, from B to C, from C to D, and from D to E, where it ends. The axis I L passes, through one of the flat ends of the vessel, through the middle of it, and terminates in the opposite end, and has a boss O P upon it, which fills up the middle part of the vessel; the boss, and part of the axis, has a longitudinal slit through it, to admit the flat circle A C E S T to turn within it, on a centre at N; this circle is divided into equal leaves, each of which fit the space between the spiral division. The dense air admitted at F will press upon the leaf that occupies the space between A and C, and drive it round together with the axis I L; as the leaf goes round, it passes between B and D, and thence to C and E, when another leaf of the circle will have entered between A and C, upon which the air from the magazine will act as before; the air, when it is dilated, and has left the spiral, will issue out of the hole *a*.

The form of the magazine I make spherical, or cylindrical, with semi-spherical ends, according to the situation and circumstances; and the materials, copper, plate-iron, or cast-iron; and when large, cast or wrought into segments, and screwed together, and paint and varnish the inside, to make them air-tight; and where it is practicable, I make an excavation under ground, so much below the surface, that the incumbent earth may be sufficient to resist the force of the confined air, and line the excavation with lead, copper, or cast-iron, or with bricks or

tiles cemented together, and covered on the inside with pitch, paint, varnish, or any bituminous matter, to render it air-tight; and to and from the magazine conduct the air by a strong cast-iron pipe, on or near the top of which must be a safety valve, for the security of the magazine, and a stop-cock, to close the pipe occasionally. In witness whereof, &c.

Account of a Method of gaining Land from the Sea. By Mr. JOHN KNAPPING, *of South Shoebury, Essex.*

From the TRANSACTIONS of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

The Gold Medal was adjudged to Mr. KNAPPING *for this Communication.*

IN the month of April, 1801, I entered into an agreement with some men who had been accustomed to make embankments against the sea, to enclose 234 acres of saltings, or broken ground, which I had hired, upon lease, of the Right Hon. the Earl of Winchelsea, in the island of Foulness, and which was overflown by the sea every tide. I could have enclosed nearly 20 acres more at the same time; but did not deem it prudent, because in that case the base or foot of my new bank must have been set too near the ocean; and by that means the surge, when the wind blew hard from the East, or North-East, would have been liable to damage and undermine it. The base or seat of my new wall is 32 feet; and I first contracted to have it only six feet high, and to be six feet wide on the top: to complete which, I agreed to give the men 58 shillings per rod. There are 304 rods of it, and the

the work so executed came to 881*l.* 12*s.* But, judging afterwards that its base would still bear an additional height, which I conceived to be necessary for the better security of the land, I had the wall or bank made a foot higher, and allowed a contraction of one foot more for the slope, or *batten*, as it is termed; so that its dimensions now are 304 rods in length, 32 feet base, seven feet perpendicular height, and five feet wide at the top. This additional height cost me about 150*l.* more, which, added to the price of the first contract, and the planks for the workmen to wheel their barrows upon, &c. made the whole cost of the embankment amount to very nearly 1100*l.*

This wall, or bank, is entirely formed of earth, a considerable part of which I obtained by cutting a ditch, or *delft*, as it is usually termed, about nine feet wide, and about fifteen feet from the foot or base on the land side of the wall. This delft serves as a reservoir to take off the rain-water from the newly-inclosed land, which is conveyed through the wall, or bank, into the sea, by a sluice or gutter, which is open when the tide is out; and through which gutter also the salt water can be let in, when necessary, to fill the delft or the ditches cut between the different fields, or enclosures, to keep cattle apart, &c. By the end of the month of October, 1801, this undertaking was completed, and the wall, or bank, remains firm and good, and will receive considerable strength and stability by sowing the seeds of the couch grass thereon, and feeding the same closely with sheep.

Before the land was thus enclosed, no use could be made of it, except that of grazing it occasionally with a few sheep when the tide was gone off. It now begins to grow quite solid, and will already bear the weight of a large bullock. It naturally begins to produce a sort of fine

fine grass, which sheep in particular are very fond of, and which is of a wholesome quality, but not as yet very nutritious, or fattening. That property, however, it will acquire more and more every year; and it will, I doubt not, in the course of less than twenty years, be as good grazing land as any on this level, and may by that time be converted into tillage, if required.

In addition to the preceding statements respecting the land gained from the sea, by Mr. J. Knapping, in the island of Foulness, the following observations, by Mr. J. Wise, of Rochford, may probably be of some use for the perusal of those concerned in embankments of that nature.

In one of my first descriptions of the island in question, you will recollect that I said the greatest part thereof belongs to the Earl of Winchelsea; and, among the number of farms in that place, that which Mr. J. K. now occupies, called East-Wick farm, is one of those which are the property of his Lordship. At the expiration of the last lease of the said farm, the old tenant refused it upon the terms offered to him; and among those who applied to rent it, was the present tenant, who voluntarily proposed to enclose, embank, and secure the saltings adjoining thereto, as they are termed, at his own cost and charge, provided that his Lordship would agree to grant him a lease upon certain terms and conditions then specified. With these proposals his Lordship was well pleased, and not only granted him a lease for twenty-one years, at a certain rent, but likewise made the like propositions to another tenant who held a farm adjoining; and to these propositions the other tenant also acceded. Had the tenants not agreed to enclose the saltings, it is probable

probable that his Lordship would have undertaken it at his own expense. But it must appear to be much more eligible, to every thinking man, for the tenant than for the landlord, in such cases, to do it; because the tenants are more likely to understand the nature and the mode, as well as the expense of embanking, than their landlords; and all that the landlord has to do, when such a thing is taken in hand by his tenant, is to see that it is done substantially. Under these circumstances Mr. J. K. undertook the matter in question; and he has completed it in a very superior manner.

His next object then was to discover and pursue some plan by which both himself and the community might be most benefited by this new inclosed land. It had been found by others, in similar cases, that to break up and convert such land into tillage too soon, would not answer; for the quantity of salts with which it is impregnated is so very great, that, when exposed to the sun, &c. they completely chrystallize the soil; and although the green corn, during the winter and spring months, may have a luxuriant and healthy appearance when sown thereon, yet, as soon as the earth begins to get dry, it is scorched and burnt up, so that scarcely any of it arrives at perfection. The plan, therefore, to which Mr. J. K. resorted was, that of stocking it hard with sheep, and small Welch or Scotch cattle, which will eat a sort of weed provincially termed Lamb's Tongue (somewhat resembling the *sweet gale* in appearance, but not in smell), and which sheep in particular are fond of. By feeding it closely with sheep (and of these the Welch, Norfolk, or Southdown sorts, are to be preferred), the land becomes every year more solid, the briny particles subside, and a sort of very fine small grass naturally begins to grow, within the course of eight or ten years after it has been embanked; and,

and, in less than fifteen years, it may be converted into tillage, and will produce wonderful crops, sometimes of mustard-seed, &c. But as these pernicious crops are what no tenant ought to be suffered to grow, so will it be the utmost wish of the present tenant to avoid growing them; for they usually so taint the soil, that they can never afterwards be eradicated or destroyed. The best way is to pursue the grazing system above alluded to, for at least the first fourteen years; and then, having previously laid out and divided the land into separate inclosures, it may be converted into tillage for corn, and that to advantage. An excellent mode of managing such land, if it is meant to be tilled, is to lay about eight waggon-loads of chalk upon every acre, when it has been embanked about fifteen years, and not to plough it till five or six years afterwards. It will then grow any sort of grain, and especially oats, beans, and wheat, in great abundance, and of most excellent qualities. Such is the process of management which the present tenant means to pursue; and there is scarcely a doubt, but it will answer his warmest expectations, should his noble landlord allow him sufficient encouragement to pursue it.

I beg leave to make another remark before I conclude this Essay; and it is this. If a quantity of the seeds of the cooch grass be sown; or, what is still preferable, if the roots of that grass be planted upon the bank, or mud wall, when it is first formed, that, with the treading of the sheep, &c. will tend much to strengthen its texture, and to preserve it from being injured by the tide.

From another letter of Mr. Knapping, it appears that he began to undertake this embanking about the beginning of the month of April, 1801, and that in the month of September following the whole was completed; that upwards

wards of 230 acres of land were effectually inclosed and secured from the sea, at a very considerable expense, viz. one thousand pounds and upwards; and that this land is already converted into pasture, capable of feeding a great number of sheep, and even bullocks, and is likely to become, in the course of a few years, fit for tillage, or any purpose to which land can be converted.

The above statement is confirmed by the Certificates,

T. ELLWOOD, Curate of Foulness.
WM. POTTON, Churchwarden.
T. WIGGINS, Overseer of the Poor.
EDM. WITTON,
F. BANNESTER, } Inhabitants.
W. MEAKENS.

Account of Experiments on feeding Cattle with Potatoes. By JOHN CHRISTIAN CURWEN, ESQ. *M. P. of Workington Hall. Communicated to the Society for the Encouragement of Arts, &c. in a Letter to their Secretary.*

From the TRANSACTIONS of that SOCIETY.

The Silver Medal was voted to Mr. CURWEN *for these Experiments.*

IN a letter, which I had the pleasure of addressing to you some time ago, I took the liberty of hinting at an experiment I was making, in giving Steamed Potatoes as a substitute, in a great measure, for Hay.

I was then wholly unacquainted with its having been tried. It was from my friend, the Bishop of Landaff, I first learnt that the Board of Agriculture had made a re-

port upon it. As I do not find that was carried to any great extent, nor given in the way I have done, I shall, with much deference to the Society of Arts, &c. offer what has occurred to me, together with the plan I have adopted for steaming and washing. Having nothing of the kind to assist me in my beginning, I found great difficulty and much time consumed, which I trust this will remedy to those who may be inclined to make the experiment.

My respectable friend and neighbour, the Bishop of Landaff, took the trouble of examining the process, and inquiring into every thing relating to it, and has certified the complete success of the plan, and his approbation of the apparatus. It was in consequence of the alarming failure in the hay crop of the year 1801, that I found myself called upon to take some steps to prevent the serious consequences which were likely to result from it. The importations of hay from Ireland, in August, were from 9*d.* to 11*d.* per stone of 14 pounds. In this situation it fortunately occurred to me, that I had for many years given a proportion of Steamed Potatoes, mixed with the other food, to my hounds, and found it to answer extremely well. If hounds could stand their work with this feed, I could scarcely admit a doubt of its being a hard as well as nutritious food. Under this impression, I began my steaming in October, 1801, and continued it till late in May. The prejudices I had to encounter were such as would have defeated the plan, had I not followed it up for some months, with constant and unremitting attention; and whoever attempts it will have difficulties to contend with, that require particular attention to overcome. In no one instance did it fail, and my horses were never in such spirit and condition. In October last I recommenced my operations, and am able to steam from 160 to 200

stone,

stone, of fourteen pounds each, per day; I have fed upwards of eighty horses constantly both seasons; and this year I have extended the feed to my milch cows, taking away all hay, and only giving a little straw. Each horse has a stone and a half of potatoes, or twenty-one pounds, estimated at 3*d.* per stone—4½*d.*; steaming, a halfpenny; ten pounds of bruised corn, 6*d.*; five pounds of hay, 2*d.*; two pounds of cut straw to mix with the corn, a halfpenny; making on the whole, 13½*d.* per day. Each tub of potatoes, containing eleven stone, has one of cut straw mixed up with it; it is given warm, and a horse will eat a stone in less than half an hour, whilst between six and seven would be required to eat a stone of hay. The time gained for rest contributes greatly, I have no doubt, to promote the health and condition of the horses.

The facility with which potatoes can be transported from place to place is much in their favour, and being without damage, to which hay is liable, is a further object. The individual gain will be found great, where ground is highly rated and not easily procured, as will be commonly the case where horses are most wanted. In a national point of view, it may be important, should the population of the country advance as rapidly as it has for some years past. The potatoe crop is produced from ground which would otherwise be under fallow; and when proper care is taken, the wheat after potatoes is equal, if not superior, to that from fallowed ground. The year previous to my adopting my present method, I sunk the rent of my farm, valued at a thousand pounds (about 700 acres), and seven hundred pounds besides. In the last year I cleared, receiving the same prices for my work, 2189*l.* The only difference I can point out is in the price of oats; this might deduct 300*l.* I had forty acres last year under potatoes; the wetness of the ground,

and the very unfavourable season, made my crop a bad one. I shall have this year sixty. I have found no difficulty in importing from Scotland and Ireland, at 3*d.* and 3½*d.* per stone. The quantity being more than I required, I have sold to the poor at reduced prices at 3*d.* whilst the markets were from 5*d.* to 6*d.* I had 300 acres under hay, and never sufficient; I expect that 150 now will be more than sufficient for all my wants. The value of hay was heretofore in proportion to my necessity; having no longer occasion for any, the price will fall to the neighbourhood. Indeed, it has, as I might purchase at 6*d.* per stone, what was seldom or ever under 9*d.* and more frequently a shilling; I have every pound of hay weighed, so as to prevent all waste; and though this is some trouble and expense, I have reason to believe it is amply repaid by the economy it enforces.

I beg pardon for the unreasonable length of this letter. Without a considerable degree of enthusiasm, I should never have got through with my undertaking; and the Society will, I hope, excuse me, if I have attached more importance to the matter than it deserves. If any farther information should be wanted, I shall be happy to give it.

P. S. I make no difference in the feed of a cart horse, or one of my carriage horses; the allowance is the same. The coals for steaming 160 stone of potatoes, I have found to be two Winchester bushels and a quarter, or 137lb. of coal.

	£.	s.	d.
One labourer also is sufficient to steam, wash, &c. 160 stone - - - - - -	0	1	8
Two Winchester bushels, and a quarter of coals, at 3*d.* each bushel - - -	0	0	7
	0	2	3

The

	£.	s.	d.
The cost is therefore under a farthing per stone, leaving a residue of 13*d.* per day, which in six months would produce - - -	9	15	0

The cost of the apparatus, washer - -	12	12	0
Four tubs, at 2*l.* 2*s.* each - - -	8	8	0
Boiler - - - - - - -	5	5	0
Platform for the tubs - - - -	10	10	0
Pump - - - - - - -	5	5	0
Building - - - - - - -	60	0	0
	102	0	0

In addition to the preceding account of my experiments on potatoes, I wish to add a few observations, to guard such as may be inclined to make the experiment of feeding with them, against the pernicious effects of the liquor which distills from the potatoe. The first attempt I made to give potatoes to hounds, was fifteen years ago: they were boiled with their other food; but I was soon obliged to desist from it, the hounds being very violently purged and affected by it; from this trial I was satisfied, that the potatoe liquor contained a very poisonous quality, which must be highly pernicious. Indeed, I have no doubt, if any animal was suffered to drink the water which comes from the potatoe, it would be destroyed by it. It is upon this account I adopted the leaden cistern upon which the tub rests, and into which the steam is introduced. Though I am satisfied there is a great loss of steam by it, and an increased expenditure of fuel, yet to keep clear of the potatoe liquor

quor mixing with the potatoes, is of the first importance. As a remedy against the loss of steam, I should advise to lengthen the steam-pipe in the cistern, so as to throw the steam to the centre of the tub, and to have a hole cut, and covered with a leaden cap, with holes for the steam to pass through, by which means the condensation will fall by the sides of the tub, and much steam be saved. The potatoes are made much dryer, by suffering them to stand a few minutes in the tub, after the steam is taken from them.

I had so little assistance from any thing previously done in steaming, that the first season it required five men to do the work which one man can now accomplish with ease. It took two persons to wash them, which they did in a very incomplete manner; two to steam and bruise, and one man and a horse to furnish water. The washer will be found to answer the purpose admirably well; and when the saving of water is an object, its value will be increased. Several private families have adopted them upon a small scale, and found great convenience from it. I believe the method I have adopted, of mixing a portion of cut straw (from a tenth to an eleventh part), is highly advantageous; first, as it prevents the food passing too quickly, and secondly, as it keeps the mouths of the horses from being clogged with the potatoes. Should doubts still remain, as to the performance and health of the horses thus fed, I am ready to afford unquestionable proof from the persons who have the care of them. I shall always be ready to answer any questions, or to afford any farther information in my power.

From what I have previously stated, the advantages I have already reaped from this method will be apparent; and I cannot but sincerely wish, both for the advantage of the publick and individuals, that through the medium of

of your most useful and respectable Society, it may come recommended to them, which cannot fail of having considerable effect.

P. S. When the potatoes are sufficiently done, being of a heat equal to the steam, the distillation ceases, and the steam comes through the cock. The condensed water from the steam formed during the operation, is allowed to run off, affording a constant stream.

The above statements were confirmed by Certificates from the Bishop of Landaff, and Arthur Young, Esq.

Observations on the Chay Root, a Species of Madder used for Dying durable Red Colours in the East Indies, with a Method of using it with Advantage in English Calico Printing. By J. FLEMING, *Inspector of Drugs. Communicated by* JOHN STOCKWELL, *Esq. to the Society for the Encouragement of Arts, &c.*

From the TRANSACTIONS of that SOCIETY.

THE following Paper was drawn up by Mr. Fleming, agreeably to the desire of the Board of Trade of the India Company, signified to him by their Secretary, W. A. Edmonstone, Esq.

It is rather surprising, considering the pains that have been taken in Europe to discover, or at least to imitate, the method of dying the Turkish or Adrianople red, that so little attention has been paid to the equally beautiful and permanent red given to their calicoes by the natives of the coast of Coromandel. Although full accounts of the practice of calico-printing in the East Indies were sent home long ago by the missionary Cœur Doux, M. Poivre,

Poivre, and others, it does not appear that the European artists have ever tried their skill in the Chay root, the drug by which the admired red colour is produced. I have never heard, at least, of any such attempts, nor do I believe that the root has ever been sent home. It is evident, from the manner in which this drug is mentioned by Dr. Bancroft, in his "Experimental Researches," p. 174, that well-informed writer had never seen it, which I think could scarcely have happened, had it been at all known to the London dyers.

It is probable that the tediousness of the Indian process, as described by those who sent home the accounts of it, consisting of many tiresome manipulations, continued during a period of nineteen or twenty days, deterred the European artists from trying the effects of the Chay root in dying or printing their cottons. What may appear more extraordinary is, that the same cause, co-operating perhaps with the natural indolence of the people, and their having cheaper, though inferior, red dyes at hand, has prevented the use of this root from obtaining in Bengal; for, so far as I can learn, it is not used in this part of India. The natives here are content with the red produced by the *Aul Munjiet*, and other drugs, though the colours yielded by these are far inferior to those of Madras calicoes. On this account I am surprised at the measure which has been adopted, of sending round hither such a large quantity of the Chay root from the coast. I apprehend very little or none of it will be purchased at the approaching sale, in which case it must be either returned to Madras, or sent to England. The expediency of this last measure must depend on the possibility of so abridging the process of dying, or printing cottons with Chay root, that the English artists may find it worth their while to have recourse to it for the reds and

purples,

purples, instead of the Smyrna madder, or whatever other drugs they use for those purposes at present.

To ascertain this point, I have, agreeably to the instructions of the Board, made several experiments with the Chay root; indeed as many as the shortness of the time, and my other avocations, would permit. From the result of these trials, I entertain great hopes that the English calico-printers will not only shorten the process so much as to finish it within a tenth part of the time required for the Indian process, but that they will by the Chay root dye their cottons of a brighter red than can be done by madder, or any other vegetable.

It is needless to detail the many trials I made, which either failed altogether, or succeeded in a very imperfect degree. I shall therefore only mention that process which I found to answer best, and by which the piece of cotton cloth, which I herewith send you for the inspection of the Board, was printed. Having made a decoction of two ounces of powdered *Hurr* (the fruit of the Myrobolona Citrona *) in a quart of water, I took a piece of Madras cotton cloth, and boiled it in the decoction for about half an hour. Having taken out the cloth, and washed it well with cold water, I dried it in the sun, and afterwards had it properly ironed and smoothed for the pencil. I then took some of the acetite of alumine, made in the manner directed by Dr. Bancroft, and thickening it properly with gum-arabic, I delineated a flower with this mordant upon the cloth, and dried it in the sun. I afterwards washed the cloth in cold water, to clear it of the superfluous acetite, and dried it again in the sun. I then infused about two ounces of the Chay root, coarsely powdered, with about a quart of water, in a vessel well

* Aleppo galls will probably answer as well as the Hurr.

tinned, and setting it on the fire, as soon as the liquor began to grow warm, I put the cloth into it, and let it remain until it had boiled about half an hour, during which the cloth was frequently stirred. I then took it out, and having rinced it well with cold water, I put it to dry in the sun. The delineation of the flower now appeared of a good bright red, and the ground of the cloth, though slightly tinged, was much less so than I expected. By washing it again with cold water, and afterwards with soap and water, and exposing it for a whole day to the sun, during which it was frequently besprinkled with water, I brought it to the state in which you now see it. The whole process has only taken up about six and thirty hours. I should have mentioned, that the washing with soap heightened the brightness of the red considerably.

Making allowance for my want of experience in the practice of dying, and considering the great improvement which may be expected in the process from the superior skill of the English artists, I think we may conclude, even from this imperfect essay, that the Chay root will be a valuable acquisition to the English calico-printers. I therefore recommend, that so much of the root as may remain unpurchased at the sale, or at least that a part of it, may be properly packed up and sent to England by one of the ships now under dispatch.

This drug is the root of a plant called by the botanists *Oldenlandia Umbellata*. I have not met with it in this part of India; but it grows naturally on the coast of Coromandel, where it is also cultivated in great abundance, for the use of the dyers and calico-printers.

The sample which you sent me appears to be of a good quality, and in good condition. It is said that the root will remain with its virtues entire for several years, and

that

that they are even improved by keeping. If this be the case, and provided the dyers at home find it answer, this circumstance is a very favourable one, and must enhance the value of the drug as an article of commerce.

Minute of the Board of Trade, dated April 10, 1798.

The Board are of opinion, that the result of the inspector's experiments will afford very acceptable information to the calico-printers in England; and if their operations should prove his ideas to be well founded, the plant may prove a valuable acquisition to the manufacturers of Great Britain, and also an article of commerce from the coast particularly useful, as there is a want of coast articles of low value, as well light, as a sufficiency of ponderous, to make up a proper cargo for a large ship, without swelling its value to too great a risk, as would be the case were a ship to be loaded entirely with piece goods.

Account of the Method used in recovering the Dutch Frigate Ambuscade, *of* 32 *Guns, sunk near the Great Nore. By Mr.* Joseph Whidbey, *Master Attendant in Sheerness Dock Yard.*

From the Philosophical Transactions of the Royal Society.

At eight o'clock in the morning of the 9th day of July, 1801, the Dutch frigate Ambuscade left the moorings in Sheerness harbour, her fore-sail, top-sails, and top-gallant-sails being set, with the wind aft, blowing strong. In about thirty minutes she went down by the head, near

 the

the Great Nore; not giving the crew time to take in the sails, nor the pilot or officers more than four minutes notice before she sunk; by which unfortunate event twenty-two of the crew were drowned.

This extraordinary accident was owing to the hawse-holes being extremely large and low, the hawse-plugs not being in, and the holes being pressed under water by a crowd of sail on the ship, through which a sufficient body of water got in, unperceived, to carry her to the bottom.

The instant she sunk, she rolled over to windward across the tide, and lay on her beam-ends; so that, at low water, the muzzles of the main-deck guns were a little out of the water, and pointed to the zenith, with thirty-two feet of water round her.

The first point I had to gain, was to get her upright. Before I could accomplish it, I was obliged to cut away her fore-mast and main-top-mast; which had no effect, until the mizen-mast was also cut away; she then instantly lifted her side, so that at low water the lee railing on the quarter-deck was visible.

By proceeding in this manner, the first part of my object was obtained, with a secured main-mast, and all its rigging, to enable me, should I be fortunate enough to weigh the ship, to lighten her by it with the greatest possible expedition.

The ship being in the forementioned state, gave me an opportunity, the next low water, to get out her quarter, forecastle, and some of her main-deck guns, with a variety of other articles.

I next proceeded to sling her; which was done with two nineteen-inch cables, divided into eight equal parts. The larboard side of the ship being so much higher than the starboard, enabled me to clench each of the ends

round

round two of the ports, excepting one that was clenched round the main-mast; and with great difficulty, by long rods and diving, I got small lines rove through four of the ports on the starboard side, by which means I got four of the cables through those ports across her deck, which were clenched to the main-mast and larboard side, having four ends on each side completely fast, at equal distances from each other. I brought the Broederscarp, of 1063 tons burthen, out of the harbour, which received the four ends on the starboard side; also four lighters, of 100 tons each, which took in the other four ends, on the larboard side, over their bows. All the eight ends were at low water hove down with great power, by a purchase lashed distinctly on each of them. I then laid down two 13-inch cables, spliced together, with an anchor of 24 cwt. in a direction with the ship's keel. On the end of the cable next the frigate a block was lashed, through which was rove a 9-inch hawser, one end of which was made fast to the ship; the other end was brought to a capstan on board the Broederscarp, and hove on it as much as it would bear, with an intention to relieve the frigate from the powerful effect of cohesion. This had so far the desired effect that, at about half flood, I perceived the ship to draw an end, and swing to the tide; and all the slings were considerably relieved. At high water she was completely out of her bed. At the next low water I hove all the purchases down again. At half flood she floated; and the whole group drove together into the harbour, a distance of three miles, and grounded the frigate on the west side of it. It took me two tides more to lift her on the shore, sufficiently high to pump her out; which was then done with ease, and the ship completely recovered, without the smallest damage whatever, either to her bottom or her sides.

I do

I do not apprehend there is any thing new in the mode I adopted in weighing the Ambuscade, excepting the idea of removing the effect of cohesion, by the process before described; and I have every reason to think, that if that principle had been acted on in the attempt made to weigh the Royal George it would have succeeded.

On the Advantages of Mr. BOSWELL'S *Patent Method of constructing Ships.*

Communicated by the Inventor, in a Letter to the Editors.

GENTLEMEN,

I HAVE at length the pleasure to inform you, that I have compleated the arduous undertaking which I commenced shortly after I last saw you.

Those alone who have experienced the trouble of having new ideas put in execution on a large scale, can conceive what it is to have to struggle with ignorance, insolence, illiberality, and injustice in all its varied forms, from open pilfering to artful over-reaching deception, in addition to the usual difficulties. And the delay which naturally attends the first construction of any thing, having been studiously increased by the artifice of those I had the ill fortune to employ, has protracted this scene of contest so long, that it is only at the termination of the second year from the passing of my patent that I have been able, with the most strenuous exertions, to produce the first specimen of my method of constructing ships for which it was obtained.

The ship Economy, of London, 200 tons measurement, built on this plan, is now moored opposite the Union Stairs, where she will lie some time for the inspection of

those

those who have an interest in constructing large vessels in the cheapest and strongest manner ever yet laid before the public.

The plan adopted in the formation of this ship is the third mentioned in my specification, and the one designed for large vessels, of 500 tons and upwards.

As my specification, published in your Repertory *, may not be in the hands of all those who see this paper, I will add a short description of the ship.

Its external appearance is nearly the same as that of any other vessel of the size, and the outward planking done in the usual manner. It is the internal construction alone to which the patent relates, and that is as follows:

The best general idea of it will be obtained, by conceiving a vessel built with timbers, or ribs, much smaller than usual, with an internal framing, so contrived as to give every requisite support and strength both to them and the entire vessel, with the least timber, and of the cheapest form, and without any knee-timber.

The floor-timbers are molded seven inches, and sided six: these, with four futtocks and two top timbers at each side, form what is called a frame of timbers. Those small timbers are laid down so that their terminations all fall out in fair lines, which are nearly the same as the ribband lines, when below the wales. Along those lines inside are laid fore and aft ribs, from stem to stern post, so as to support the extremity of every one of the small ribs in the ship. The fore and aft ribs are six in number at each side; one directly under the water ways, another at the level of the lower beams, and the other four placed nearly at equal distances between these last and the kelson: each pair uniting in a breast-hook at the stem.

* See vol. II. Second Series, p. 81.

The

The pieces of timber which form these fore and aft ribs are scarfed at their extremities with hook scarfs, and so placed that the scarfs fall out in fair vertical sections of the ship, where they are supported, and firmly bolted to transverse framings, contrived so as to unite the greatest strength with the least obstruction, and which are five in number in the whole ship.

Those transverse framings last mentioned must be considered as the great support of the vessel, and the foundations, as it were, on which all the other parts rest, as the beams of a wooden bridge are supported by the piers. (I mention this, because some who pretended to understand the plan have absurdly proposed their removal.) Those transverse framings are each formed by one upper and one lower beam, two pair of futtocks, a floor timber, two pair of top timbers, and four bracing pieces; the whole connected into one firm framing, self-supported, independent of any other part. Some, from the similarity of the sides of these frames to riders, have not hesitated to pronounce them such: but to a candid observer the whole of this distinct self-supported framing will be obvious, and evidently such as has been used in no other vessel hitherto.

The four bracing pieces form each framing into a set of triangular compartments: which triangular framing gives the greatest stability possible, as a triangular frame cannot be made to give in, or alter its figure, by any force which is not sufficient to tear its connecting parts through the timber of which it is composed; a property which no other figure possesses.

These transverse framings (besides supporting the fore and aft ribs, and by them the small vertical timbers) tie and unite the vessel together, across ship, so as to give much greater strength than hanging-knees, whose place they supply, at a much cheaper rate.

The

The framing of the deck is also divided into triangular compartments, as specified in my patent, so as to preclude the use of lodging-knees entirely; which compartments are formed by six pieces of timber, which proceed obliquely at each side, from the top of each beam to the fore and aft rib next adjoining, into which they are dovetailed and bolted; long carlings from beam to beam, at each side of the hatchways, with these pieces, support small ledges, on which the deck is laid in the usual manner.

The vessel in coming round from Southampton water sailed remarkably fast, and stayed and steered admirably well.

Advantages of this Method of framing Ships.

1st. Timber of less than one fourth of the usual girth can be used, in this method, in constructing large vessels, for nearly four-fifths of their frames.

This will be a direct saving in the difference of price of small timber and large for the quantity used; for large vessels this will be considerable, and, according to the present contract prices for naval timber, not less than from two to four pounds per load. Besides this, it is a great national benefit in another point; for, by this means, timber of half the number of years growth, or less, can be used for naval purposes; and thus forty or fifty years, or even less, be sufficient to produce timber fit for the navy, instead of the vast period of near a century, now necessary; by which the land will not only produce a double crop in the same time, fit for this purpose, but all danger be removed of there being a stoppage of building, for want of a supply of timber, at any future period; an event extremely probable to take place, from the increasing difficulty of getting the large kind used at present in the Royal Dock Yards.

2d. Much shorter timber may, in forming the futtocks, be used, without any danger of weakening the ship, on account of the great support given to them by the fore and aft ribs, and other internal framing, before described.

The advantage of this is, that it renders the compass timber for futtocks easier to be procured, and prevents any necessity of using any timber cut across the grain.

3d. The use of knees of every kind is superseded by this mode of building, as the triangular framing of the decks gives all the effect of lodging-knees, and that of the transverse frames more than supplies the support given by hanging-knees.

This would occasion a considerable saving in large vessels, on account of the great price of knee-timber fit for them; which, for that of 30 feet meeting, is near ten pound per load, and for the smallest kind, taken at the dock-yard, not less than 8*l.* 15*s.*

4th. Plank of half the usual thickness may be used for lining; the great support given by the fore and aft ribs rendering any use of inside plank, to strengthen the vessel, needless, and confining its purpose merely to prevent ballast, or other matters, from getting between the timbers, so as to rest on the outside plank.

This will also cause a saving of consequence in large vessels; plank of all kinds, but particularly that of great thickness, being the next dearest article to knee-timber.

5th. It is probable a much less quantity of timber might be used with safety in this method, on account of the great strength produced for the timber used. 1st. By the triangular framing. 2d. By every timber having a solid support at each extremity. 3d. By the increase of thickness from in to out all along the fore and aft ribs being very great in proportion to the timber used.

6th.

6th. It is probable, vessels built in this method will last many years longer before decay; because the use of small timber admits of a kind more spiny and durable than the large, which is often dotard, and never lasts so long; and also because this construction admits of a free circulation of air among the timbers, than which nothing is known to contribute so much to their preservation. It is moreover conceived, that the timbers being prevented from working by the solid support each has at its extremities, will cause the vessel to wear less, and at the same time render it safer, by diminishing the danger of starting planks, or otherwise causing bad leaks.

7th. The timber of considerable size used in this method is almost all nearly straight, or of very little curvature, on account of its running fore and aft.

This kind is much easier to procure than large compass timber.

8th. Short-top timber and coarse butts can be worked up to advantage, instead of being sold for less than half cost, or burned; as this kind will do sufficiently well for the number of short ledges in the deck frames, and to support the lining at the floor, which are wanted in this mode of building.

9th. Vessels built in this manner will not be so liable as others to hog, or have their backs broken, on account of the great strength length-ways, caused by the fore and aft ribs.

10th. Vessels so built will be drier, from the circulation of air before mentioned, and having the floor-lining detached from the timbers; which quality renders this construction particularly valuable for the ships used in the East and West India trade.

The advantages above recited relate to vessels entirely formed in this manner. It should be known also, that

 parts

parts of this plan may be applied with profit. The mode of framing the decks, for instance, might be used to save lodging-knees in vessels built in other respects in the usual mode. Other parts of it might be applied to the strengthening old vessels, which, by this means, might be made to last many years, after they would otherwise have been unserviceable.

The principles of this method of building are capable of being extended still further than they are in the vessel here described: the triangular framing may be even adopted to the construction of fore and aft ribs, so that I could have them constructed also of small timber, if required. Thus, by this means, the former barrier to the increase of size in ships is removed, as it no longer now depends on the size of timber; and ships of any dimensions required may be formed, of any strength requisite, of small timber.

Before concluding this paper, I take the opportunity to offer to notice another matter of some consequence, though in an inferior degree; which is a capstan that I have contrived, so as to deliver off the messenger as fast as it receives it, without requiring to stop, to raise, or shift the messenger; and this it performs without any of the complicated means used in most other methods for the same purpose, or occasioning any additional friction, which most hitherto made public do. It is also so easily formed, that any good shipwright could make it.

I also beg leave to caution the public against some patents taken out since the date of mine, particularly one a full year after, which directs the use of diagonal ledges in the framing of decks, and which, in other respects, seems to be an intended imitation of my patent. Now as one of the chief parts of my invention consists

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in the use of triangular framing in the deck-framing and elsewhere; and as it is an utter impossibility to use diagonal pieces in frame-work without producing triangles, I leave every one to judge of the risk that will be run in adopting such evident infringements of my right.

Any farther information relative to the advantages to be expected from my patent method of constructing large ships from small timber, I will give with pleasure to any who have serious motives for the enquiry, or answer post-paid letters, directed to No. 9, George's-street, Minories, where I am now ready to receive proposals for superintending the construction of other vessels on the same plan.

I am, Gentlemen,

Your very humble servant,

J. W. BOSWELL.

Description of a self-acting Water-Closet; invented by T. W. *Esq. of Batheaston, and communicated by Mr.* BENJAMIN HOOKE, *Optician, Fleet-street.*

With an Engraving.

A, Fig. 5, Plate XVI. the reservoir.

B, a copper or leaden cylinder, having an inverted valve at the top, and an upright valve at the bottom, which are connected with each other, and to the end of the lever C, by a wire or chain. The cylinder is terminated at each end by brass flanches, which unite it to the parts fixed above and below by screws; by removing which the cylinders may be detached, and the valves new-leathered, &c.

D, the seat of the closet, fixed at one extremity by hinges, and having a wire or chain fixed to the other extremity

extremity against the side wall, which passes through the pipe E (soldered into the reservoir), over the wheel or crank F, to the lever at G.

I, the weight or counterpoise, of about three or four pounds.

K, the basin, communicating with the cylinder B at the side, and the stink-trap L and soil-pipe M beneath.

N, an air-pipe, leading from the cylinder to the open air.

O, a male and female screw, fitted to the wire by swivels, to regulate its length.

The Operation.

The counterpoise operating powerfully on the upper valve prevents the escape of any water from the reservoir into the cylinder; but on a person sitting down, the seat D is depressed about an inch, when the wire or chain, passing over the wheel to the lever at G, raises the counterpoise, and opens the upper inverted valve, and closes the lower one, which prevents the water that rushes into the cylinder from making its escape into the basin. But on the person's rising from the seat, the counterpoise again closes the upper valve, and permits the contents of the cylinder to rush into the basin by the opening of the lower valve.

N. B. The air-pipe N is soldered into the reservoir, and united to the cylinder by a swivel-screw. It should be made at least of inch-pipe, to admit air sufficient to enable the water to escape with its full force.

The basin should not be of the kind which admits the water obliquely, and gives it a circular motion, as in this case the water, being checked, has not sufficient force to drive the soil clear of the basin.

New

New Process for preparing the Muriates of Barytes and of Strontian.

By M. Bouillon la Grange.

From the Annales de Chimie.

THE decomposition of the hydrogenated sulphuret of barytes by the muriatic acid, is the means most generally employed in the laboratories for obtaining the muriate of barytes. Several chemists have announced *, that all the sulphates, excepting that of lime, are decomposed by the calcareous muriate, but they have not bestowed particular attention upon this kind of decompositions. However, I have just been informed by Cit. Vauquelin, that in the year 7 Citizens Pelouze and d'Aracq had effectuated this decomposition in the laboratory of *Ecole des Minés.* Lately also, Cit. Julia, corresponding member of the Society of Practical Medicine at Montpellier, has told me that he, together with M. Figuier, in the year 10, likewise obtained the decomposition of the sulphate of barytes by the calcareous muriate; but nothing has yet been published upon this subject. It was therefore necessary to establish, by experiments, not only a regular process for the preparation of the muriate of barytes, but also to make the application of the same process to that of the muriate of strontian. It is the more interesting to determine the state of purity in which the muriate of barytes thus obtained exists, because it has been applied to some useful purposes in medicine, as I shall shew hereafter. It was also necessary, in order to consider this

* See *Essai de statique Chimique, par le Cit. Berthollet*; *Systeme de connoisances Chimiques, par le Cit. Fourcroy.* Tom. III. p. 194; and my *Manuel de Chimie,* third edition, vol. I. p. 562.

new

new preparation in an economical point of view, to place it in comparison with the process most generally used.

The following is the most accurate method of effecting the decomposition of the muriate of barytes.

Preliminary Operations.

1. We procure muriate of lime by dissolving, in a small quantity of hot water, the residue of the decomposition of the muriate of ammoniac by lime; we thus separate the calcareous muriate from the excess of lime which always attends it, and which even becomes detrimental to the operation; we then evaporate the filtrated liquor to dryness.

2. We reduce the sulphate of barytes to powder, and pass it through a sieve.

Process.

A. After having mixed equal parts of calcareous muriate and of sulphate of barytes together, we throw the mixture by spoonfuls into a crucible, previously heated to redness. The matter becomes a little inflated, and afterwards passes into fusion. We successively add the remainder of the mixture, and keep up an equal temperature till the whole is liquified; as soon as the fusion is tranquil, we remove the crucible from the fire, and pour out its contents upon a casting slab, which must previously be heated. Without this precaution the matter in becoming solid breaks with an explosion, and is projected with great force; the pieces even carry away with them fragments of the stone to which they strongly adhere.

The matter thus cast breaks as it cools, has a whitish grey, sometimes a darker grey colour, according to the length of time that it has been kept in fusion. It is very hard,

hard, sonorous, and attracts the humidity of the atmosphere.

B. It is reduced to powder, made to boil some minutes in a small quantity of water, about six times its weight of distilled water, and filtrated.

Upon the insoluble part we pour a less quantity of boiling water, and unite the liquors.

We then evaporate to two-thirds in a well-tinned copper basin, and terminate the evaporation either in a capsule of *hygio-cerame* or of porcelain, or in one of glass or earthen-ware, placed in the sand-bath. We stop the evaporation as soon as we observe a pellicle upon the surface of the liquid. We then remove the capsule from the fire, and we obtain, by cooling, very beautiful and shining crystals, the brilliant whiteness of which distinguishes them from those obtained by the old process.

C. We evaporate the decanted liquor, and obtain a second crystallization: this affords only very small crystals, which acquire a little humidity in the air.

D. As it was wished entirely to separate the muriate of barytes, this second decanted liquor was evaporated to a strong pellicle, it was left to cool, and there was precipitated a white matter, without a regular form, which, when dried, attracted the humidity of the atmosphere more readily than the crystals obtained in experiment C.

E. Finally, the supernatant liquor was condensed to dryness, and it afforded perfectly pure muriate of lime.

The last crystallization had carried away all the muriate of barytes that might be in solution in the decanted liquor, experiment D, so that I could not discover its presence.

These first experiments not having afforded perfectly pure muriate of barytes, I resumed each of the above

crystallizations, in order to separate the calcareous muriate from them.

The first crystallization, experiment B, contained 0,425 grammes, or eight grains in the ounce, of calcareous muriate.

The second crystallization, experiment C, 0,956 grammes, or 18 grains.

The third crystallization, experiment D, gave 2,388 grammes, or 45 grains of calcareous muriate in the ounce.

These results prove that the muriate of barytes, in order to be entirely freed from the calcareous muriate, as it ought to be for the purposes of analysis, requires to be subjected to a second crystallization; and then we obtain the salt in great purity. It is likewise a necessary precaution, after having decanted the supernatant liquor, to pour a small quantity of cold distilled water upon them, in order to carry off the last portions of the liquid that adheres to them; when this was not done, I have found that there always remained a small portion of calcareous muriate. For medical purposes, however, it may be employed without washing.

Muriate of Barytes obtained by the Decomposition of the Sulphuret of Barytes with the Aid of the Muriatic Acid.

In order to appreciate the advantages of the new process, I have compared them with the products afforded by the ancient one.

I have found that the sulphate of barytes, mixed with charcoal and kneaded with a little oil, was but imperfectly decomposed at the temperature of our reverberatory furnaces, which is the process most commonly employed, but if with the aid of a bellows, we keep up a white

white heat, then a larger quantity of sulphate is decomposed.

If we now consider the operation in itself, we shall not hesitate to give the preference to the new process.

We shall perceive, 1, that it requires much less time and combustibles, for ten minutes are sufficient to obtain a perfect fusion, whereas the old process requires that the fire be kept up three or four hours; 2, that there is a saving in the employment of the muriatic acid, and less manipulation required, as this acid exists in the calcareous muriate; 3, that the muriate of barytes is much more pure, even at the first crystallization, whereas we are obliged to subject the other to several operations, in order to have it of the same degree of purity. It is of the greater importance to have it thus, because, for the purposes of medicine, it is requisite that it should be freed from all foreign, and especially metallic, matter.

The muriate of barytes has for a long time past been considered as a very valuable re-agent for analysis, and indicated in scrophulous disorders. In general, the German physicians employ it with much success, especially since Mr. Hufeland, first physician to the king of Prussia, has shewn the great advantages to be derived from its use. Mr. Hufeland has administered it against scrophulous diseases, the goitre, affections of the eyes, the itch, tetters, &c. The manner in which this muriate is to be taken, according to a German writer on pharmacy, is the following:

A drachm of this salt is dissolved in two ounces of any distilled water, such as that of balm, of strawberries, or any other, to which is added half an ounce of syrup of orange-peel, of cherries, &c. For an adult, the dose is

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from 40 to 60 drops of this liquor, four times a day, in a glass full of ptisan of sarsaparilla or dulcamara.

In other cases it is administered with extract of opium, or also this salt is dissolved in distilled water, and extract of cicuta or hyoscyamus added, especially in affections of the eyes.

The dose may be increased according to the state or the strength of the patient.

Of the Muriate of Strontian.

The experiments which I have just related naturally led me to examine the action of the calcareous muriate upon the sulphate of strontian.

The decomposition of this salt is more difficult to be effected than that of the sulphate of barytes, and it becomes still more so if we do not previously take care to separate the oxide of iron and the earthy matters which are found mixed with it; however we may dispense with this, if we wish to save the acid which this preliminary operation requires. The two processes which I am about to describe, have perfectly succeeded with me.

The first consists in reducing the sulphate of strontian * to powder, and passing it through a sieve; it is then wetted with muriatic acid, which seizes upon the lime and the oxide of iron; it is left to macerate for some time, the liquid is poured off, and the insoluble residuum is carefully washed.

When the matter is perfectly dry, it is mixed with a weight equal to its own of calcareous muriate, and in the remainder of the operation we proceed as has been said above with respect to the barytes.

* These experiments were made upon sulphate of strontian from the environs of Paris.

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The only differences in the manipulation are: 1, that the mixture is fused with greater difficulty, and that we obtain only a paste-like mass at a red heat, whereas when we employ a forge-bellows, we have in a very short time a complete fusion; 2, that the liquor must not be evaporated to a pellicle, for this produces a saline mass or confused crystals, mixed with a large quantity of muriate of lime, but it must be tried by taking out some drops and letting them cool in a vessel; if crystals are formed, we have the proper degree of evaporation. In this manner I have obtained a very fine crystallization, superior in whiteness and purity to that which is obtained by following the old process, and which hardly contained any calcareous muriate. This difference in its manner of crystallizing proves that the muriate of strontian is much more soluble in hot than in cold water; consequently it crystallizes by cooling. The muriate of barytes, on the contrary, is almost equally soluble in cold and hot water, and crystallizes by evaporation; an ounce of distilled water at a temperature of 70 degrees, dissolves nine drachms and fifty grains of muriate of strontian; the same quantity of water, at the same temperature, dissolves only three drachms thirty-five grains of muriate of barytes. The evaporation must therefore not be carried to the degree designated by the word *pellicle* *. Besides,

* This observation ought to prove how advantageous it would be to banish this expression from practical chemistry, and to substitute areometrical degrees in the place of this uncertain method of operation. I have already indicated, in my *Manual of Chemistry*, the result of experiments which I have made relative to this subject, upon several saline substances. I have not yet had leisure to pursue them upon other salts. See the articles *sulfates de potasse, de soude, de magnesie, acides d'alumine; nitrate de potasse; muriate d'etain, acetate de plomb; sulfates de cuivre, de fer; tartrite de potasse, &c.*

the

the more we evaporate, the more calcareous muriate is carried into the crystallization of the muriate of strontian. Upon the whole too much attention cannot be bestowed upon it, for there is some difficulty in hitting the proper degree.

The first crystallization contained only ninety-one grammes of calcareous muriate.

A second was sufficient entirely to deprive it of that substance.

We may also, as I have already observed, prepare this muriate without previously washing the sulphate of strontian with an acid.

For this purpose, we take equal parts of sulphate and of calcareous muriate, reduced to powder, introduce the mixture by spoonfulls into a crucible which we keep at a red heat for the space of a quarter of an hour. This operation requires the application of a more intense degree of heat than the preceding. When the matter is completely fused, we pour it upon a marble or a casting-slab.

It is hard, and differs from that obtained by the first process in being of a blackish colour, whereas the other is of a greyish white.

This substance is reduced to powder; it is boiled in four times its weight of water, and filtrated; afterwards the liquor is exposed to a gentle heat with the contact of the air; it soon becomes turbid and milky, a phenomenon which proceeds from the lime which has been rendered caustic during the operation, returning into the state of carbonate. It is evident that it is of essential utility thus to suffer the lime to absorb carbonic acid again, because, with the acid of this means, we may separate a very large quantity of it. The liquor is filtrated and evaporated to dryness; a new solution is made

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in distilled water: the carbonate of lime is precipitated, and we then obtain, by evaporation, the muriate of strontian, which we may cause to crystallize a second time, in order to deprive it of the calcareous muriate.

The quantity of muriate which this operation yields is very near the same with that obtained by the first process.

If we compare the quantities of muriate of strontian obtained, with those resulting from the new process, we shall perceive the decomposition of the sulphate of strontian is not performed without difficulty, especially at the temperature which our reverberatory furnaces afford; whereas, by the means which I propose, a greater quantity of sulphate is decomposed.

I shall not dwell upon the advantages of these processes; had they no others than those of the saving of time and combustibles, of finding the muriatic acid in a residuum of little value, and, finally, of avoiding the disengagement of that fetid and deleterious gas, they would be sufficient to give them a claim to be preferred by chemists.

It is known that the sulphurated hydrogen gas, which proceeds from the decomposition of the sulphurets of barytes and strontian, although it has not yet been analyzed, however distinguishes itself from that which is disengaged from the sulphurets of potash or of soda. Of this Cit. Vauquelin had a melancholy proof, when he was thrown into asphyxia by sulphurated hydrogen gas, which proceeded from the decomposition of the sulphuret of barytes by an acid. Certainly the consequences of this asphyxia are not the same as those which proceed from other elastic fluids; they are much more protracted, more exhausting, and terminating in tremors of all the lower

lower part of the body, which indicates a much more deleterious property.

Experiments have shewn, that whenever we pour an acid upon the sulphuret diluted with water the sulphurated hydrogen dissolves barytes or strontian. These substances exist in it in a greater or less quantity, according to the agitation which we are obliged to employ in order to facilitate the action of the acid; when we pour it without stirring, the hydrogen gas hardly dissolves any at all. The presence of the strontian is easily discovered; nothing more being necessary than to agitate and inflame the gas which is disengaged at the moment when the acid is added. It burns with a flame of a very distinct purple cast.

With regard to the action of several nitrates upon the sulphate of barytes, I have not yet obtained satisfactory results. In my opinion it would be difficult to decompose the sulphate of barytes by these means. The temperature which we are obliged to employ is insufficient to fuse the sulphate; if we augment it, the nitric acid is decomposed. The difference of weight also becomes very prejudicial to the success of the operation. The sulphate of barytes separates from the nitrate, and remains at the bottom of the crucible in a paste-like state, whilst the nitrate of potash swims above it; and however we may stir them, the separation takes place as soon as the matter is poured out.

The nitrate of potash is that which resists the action of fire the most; the nitrate of lime, that which is the most speedily decomposed.

Extract

On the Preparation of a Blue Colour from Cobalt, as fine as Ultramarine. By M. Thenard.

From the Bulletin des Sciences.

M. THENARD, who had been directed by the Minister of the Interior, to make a series of experiments upon the colours necessary in painting, occupied himself first with seeking for a blue that might be a substitute for ultramarine: a very simple idea led him to the solution of this problem. Having observed that the fine blue which adorns the vessels of the manufacture of Sèvres, had the arseniate of cobalt for its base, he thought that by making an accurate mixture of this salt, and of alumine recently precipitated, the same result might perhaps be attained, without operating the fusion of the matter. He made the experiment; it succeeded completely; and it succeeded equally with the phosphate of cobalt. Among the salifiable bases there is none that can be substituted in the place of alumine; every other produces only brown or black colours, or a more or less deep violet. The same is the case with the salts of cobalt; none can supply the place of the arseniate and the phosphate; and the latter has even advantages over the former which entitle it to the preference. The best proportions are: for the blue with a base of arseniate, one part of arseniate, and one part and a half or two parts of alumine; and for the blue with a base of phospate, one part of phosphate, and one and a half, two, or three parts of alumine. With less alumine we obtain violet or green hues; with more, we have blue colours, but less deep. Those of the arseniates are always less vivid and intense than those of the phosphates, and those of the phosphates themselves are a little less so than the ultramarine, which sells

sells at 100 francs the ounce. It is also evident that the degree of heat applied must have a considerable influence upon the tint which the colour acquires; it ought always to be some degrees more intense than the cherry-red. In general we may be almost certain of obtaining that which is proper for the operation, if from time to time we take the matter out of the crucible, and examine the tint which it has acquired.

The manner of preparing the arseniate and the phosphate of cobalt, has not less influence than the temperature upon the results of the experiment. It is impossible to separate too carefully the iron which the ore of cobalt always contains. Its presence would be very injurious to the purity of the colour.

In order to make the arseniate of cobalt with this ore, which the author supposes to be composed, like that of Tunnaberg, which he used, of sulphur, arsenic, iron, and cobalt, we change it, by means of the nitric acid, into sulphuric acid and arseniate of iron and of cobalt. After having evaporated the liquor, in order to disengage the excess of nitric acid, we dilute it with water, and gradually add to it a weak solution of potash, which separates from it all the arseniate of iron in the form of white flakes; then by filtrating, and again adding solution of potash, we obtain a fine rose-coloured precipitate, which is the arseniate of cobalt. An excess of alkali must not be used; for the precipitate would thereby be in part decomposed; it would become blue, and no longer fit for answering the purpose intended. From any other ore of cobalt we might, by similar or little different means, obtain the arseniate of cobalt.

In the preparation of the phosphate of cobalt we must follow another process: we first roast the ore till no more arsenical vapours are disengaged from it, notwithstanding that

that an intense degree of heat is kept up for a long time; afterwards we treat it by the nitric acid; the iron passes into the state of red oxyd, and does not dissolve; we separate it by filtration; then we condense the liquor, in order to separate the acid that is not in real combination, and now, by diluting it with water, and pouring upon it phosphate of soda, we form phosphate of cobalt, which deposites itself in the form of flakes of a deep violet colour. One part of ore affords half a part of phosphate of cobalt; we also obtain from it the same proportion of arseniate: whence we may easily estimate the price of the blue, with the base either of arseniate or of phosphate. Supposing it to contain the smallest of the quantities of alumine that have been specified, it will not cost the person who makes it more than 40 sols the ounce.

These results, though satisfactory, leave still many points to be ascertained; they would have been in a manner useless, if these colours, beautiful in appearance, had not been of a perfect blue, and if, with facility of use, they had not combined the property of being unalterable.

Messrs. Vincent and Merimée have made a great number of experiments upon them, both with gum and with oil; they have all succeeded beyond their expectations: they differ so little from the comparative ones made with ultramarine of the best quality, that the artists themselves cannot distinguish them from one another. After having been exposed for three months to the light, they had not undergone the slightest alteration; and as their colour, in this state of purity, resists the action of the most powerful reagents which chemistry possesses, that of the oxygenated muriatic, and of all the other acids, it is probable that it will prove as permanent as that of ultramarine itself.

Simple and constant Process for obtaining the Colour, known by the Name of Turkey or Adrianople Red, in its greatest Beauty and Solidity. By M. HAUSSMANN.

From the BIBLIOTHEQUE PHYSICO-ECONOMIQUE.

AFTER having made a caustic ley with good potash of commerce, dissolved in four parts of boiling water, and half a part of quick-lime which is afterwards extinguished in it, we dissolve one part of pulverized alum in two parts of boiling water, and whilst this latter solution is still hot, we successively pour into it, during continual stirring, the above-mentioned ley of caustic potash, till the alumine, which it had at first precipitated after the saturation of the excess of sulphuric acid, has been re-dissolved. We then let this solution of alumine stand quiet, after which we decant it and mix with it $\frac{1}{33}$ of lin-seed-oil, with which the alkaline solution of alumine forms a milky liquid. As the oil gradually separates from this mixture under the appearance of cream, it must not be used without stirring it anew. The skains of cotton or flax must be successively steeped in it and pressed out equally, after which they are hung to dry upon a pole, in the order in which they have been taken out of the mixture. We may dry them in a place sheltered from the rain in the summer, and in winter in a place artificially heated, and let them alone for twenty-four hours. We wash them in a very clean running stream, dry them again, afterwards steep them in the alkaline ley; wring them out and dry them a second time in the same manner as at first, taking care to begin the immersion into the ley with the skains which have been passed the last through the oily mixture, because the first always carry away a larger portion of oil than the last. It will also be very

very proper every time to consume the mixture, in order that it may not have time to attract the carbonic acid of the atmosphere; for the alkali, by returning into the state of carbonate, causes the alum to be precipitated, and acquires the property of mixing with oil.

Two impregnations of the alkaline solution of alum mixed with linseed-oil are sufficient for obtaining a fine red; but if we continue to impregnate the skains a third time and even a fourth, under the same circumstances as the first, we shall obtain extremely brilliant colours.

The intensity of the red colour which we intend to obtain, will be proportionate to the quantity of madder which we employ in the dyeing. If we take a weight of madder equal to that of the skains, we shall produce a red which the freshening operation will convert into a rose-colour; on the contrary we shall obtain more or less lively carmine tints by employing two or three, or even four parts of madder, never neglecting to add a little chalk, if the waters which we use do not contain it. Four parts of madder will produce a red of such beauty and intensity, that it could not be introduced into commercial circulation, because it would not be paid sufficiently dear.

By making the oily alkaline solution of alumine with two or three parts of water, and impregnating the skains with it twice or thrice, or even four times, in the manner above-mentioned, we shall obtain light tints, without employing much madder, but they will not have the same intensity with those that are procured by means of the same solution concentrated, and an equally small quantity of madder.

The best manner of obtaining tints light and vivid at the same time, would be to expose the deep and freshened reds for a sufficient length of time to the action of the

the ley of oxygenated muriate of potash or of soda, with excess of alkaline carbonate, to have that degree of tint that might be required, but it is very evident that this method would be more expensive.

In order to have the oily alkaline solution of alumine always nearly of the same degree of concentration, we must employ an areometer to determine the degree of strength of the caustic ley, before we employ it for the process of the solution of the alumine. This caustic ley should be made with the best potash of commerce that could be procured, and we should note the degree which it indicated by the areometer, in order that if we afterwards employed potash of an inferior quality, we might be able, by evaporation, to bring the ley obtained to the requisite degree of strength.

Caustic ley made with four parts of good potash of commerce cannot contain much of foreign salts. In making it in the large way, and after having decanted the limpid part of it, it will be necessary to stir the matter that is deposited twice every day for some time, in order that we may be able to decant from it the rest of the alkaline liquor; and in order to lose nothing of what is left in the deposit, it will be necessary to dilute it with a fresh quantity of water, which we may employ afterwards for leying the cotton, which, before it is dyed, must be well purified and cleaned. As the squeezing out with the hands might derange the threads of the cotton or flaxen skains, and consequently weaken them, it will be proper, when we operate in the large way, to squeeze them out by means of a press.

With respect to flaxen thread which we intend to dye a fine deep and permanent red colour, it will be necessary previously to bleach and impregnate it at least four

successive

successive times with the oily alkaline solution of alumine, not only because alumine and the metallic oxyds do not adhere so readily to flax as to cotton, but also because these mineral substances, being coloured, more easily quit the flax than the cotton in freshening.

As to the dyeing of thread, of cotton, and of flax, sufficiently charged with alumine by the oily alkaline solution of this earth, it is necessary first to free the skains from all saline substance, as well as from superfluous oil, by rinsing them a long time in very clean running water, after which we must dispose them, without drying them, upon an apparatus which we must invent ourselves according to the form of the cauldron in which it is to be placed, in such a manner that during the dyeing we may be able continually to stir and turn the skains, in order that they may seize the colouring particles in an uniform manner, and in all their parts.

The bath is to be composed of madder, to which a sixth part of pulverized chalk is added, and which is diluted with nearly thirty or forty parts of water. The heat must not be carried to a greater degree than that at which the hand cannot be held in the bath without scalding it, and this degree must be kept up nearly two hours. Three hours are sufficient for exhausting the madder. After the skains have been taken out of the bath, they must be washed with a large quantity of water in order to clear them, and then subjected to the refreshing operation, which consists in boiling them a sufficient length of time in water containing bran inclosed in a jar, and adding soap and alkaline carbonate, in order to give the red a rose or crimson tint.

Account

Account of the Bridge which is constructing at Paris between the Louvre and the Hotel de Quatre Nations, and of the Experiments made to ascertain its Stability.

From the BULLETIN DES SCIENCES.

With a Plate.

THE bridge of the Louvre will be the first in France in which the arches have been made of iron, or rather of cast-iron. It is even the first which has been executed in Europe according to the system adopted in its construction; and this system has the advantage of greatly economizing the metal, in comparison with that used in England for iron bridges. In fact, in that of Coalbrook Dale, on the Severn, constructed about twenty-four years ago, and which consists of a single arch, 100 feet in span, and 25 feet wide between the railings, the weight of metal that has been employed amounts to 757,000 lbs.; whereas the weight of cast metal for the nine arches of the bridge of the Louvre, will not amount to 600,000 lbs.; whilst its length between the abutments, is 516 feet, and its width between the railings, 30 feet. It is true the English bridge serves for carriages to pass over, whilst that of the Louvre is intended only for foot-passengers. However, it has been ascertained, by the experiments which have been made, that by augmenting either the number of ribs, or the dimensions of the pieces of which they are composed, it would by no means have required so much metal, though it be five times as long as the Coalbrook Dale bridge, and wider than it in the proportion of 100 : 74. The bridge of the Louvre (See Plate XVII. Figs. 1, 2, 3.) consists of nine arches, and each arch is formed of five ribs. (See Fig. 1.) To each rib there are two pillars *f f*, *f f*, implanted into beds of cast metal, fastened to the piers; a large arch *g g*, *g g*, consisting of two pieces, which join

in the middle; two small arches *h h*, *h h*; two spurs *i*, *i*, and eight supports *l*, *l*. The five ribs are joined together by braces at *a b c d*, *c b a*, and others between these; and the upright bars *u m n o p* are joined together by the brace *g r*, and the spurs *s t u x*.

The metal pieces of which this bridge is constructed, are cast near Touroude, in the Department of the Orne.

M. Dillon superintended the construction of this bridge, and made the experiments of which we are about to give an account.

A rib of the bridge, taken at a venture, had been fixed upon a frame of wood-work so joined together in parts, that it could not sensibly lengthen; to it were adapted cast-iron beds similar to those fixed upon the piers, and upright bars, with forked tops, in order to prevent the rib from deviating from it perpendicularly during its being loaded, and also to support it in case of its breaking, and seven boxes suspended at the same points where every rib will experience the pressure of a part of the flooring, and of the persons who shall pass over the bridge.

The boxes were filled at the same time, till they contained double the weight which each rib must bear under the supposition of an extraordinary concourse of people upon the bridge; and during this operation, attention was paid to the changes of figure which took place in the great arch *g g*: it successively sunk at the key or summit *d*, and rose towards the haunches *b b*, as every other body possessed of a slight degree of elasticity would have done, and it returned to its former position in proportion as the load was diminished.

These experiments therefore prove, 1st, that the system adopted has a degree of solidity more than what is necessary for the purpose for which it is intended, since the ribs upon which the experiments were tried, resisted

a weight twice as great as that which they were required to bear, though deprived of the increase of resistance which they will require from the flooring, according to the manner in which it will be connected with them; 2d, that the cast metal, though sufficiently soft to be engraved upon and pierced cold, in order to obtain a regular and solid combination of the parts, has yet sufficient tenacity not sensibly to change its figure, nor to distort the symmetry of the forms.

Account of an improved Machine for stamping Ores. By M. DUHAMEL.

With an Engraving.

From the JOURNAL DES MINES.

WHOEVER has considered on the manufacturing of ores cannot be ignorant of the advantages which result from stamping stony substances, in which these minerals are found to exist. The machines employed in this operation have been in use a great length of time; they have been successively brought nearer to perfection, and are still susceptible of improvement.

Messrs. Daubisson and Lefroy have made some valuable remarks on this subject in former parts of this work. The principal object of the latter engineer is to make known the form and disposition of the cams fixed on the axis of the wheel, in order to raise the stampers vertically, without pushing them from, or drawing them towards, the axis of the wheel the least possible, with a view to diminish their friction against the guides; a friction which lessens the power, wears the stampers and the blocks between

tween which they play, and produces a considerable shaking and unsteadiness throughout the whole machine.

M. Lefroy was well aware that it would be impossible to avoid entirely the friction in question, while the cams on the axis of the wheel were left to act immediately under the arms of the stampers.

All the world allows that it is essential that the stampers should be raised by their centre of gravity, which will be the case in executing that which I am about to describe.

The following is a new method which I think will accomplish the desired object, and give action to the stampers without diverting them from their vertical situation, without producing shocks to the carpentry, or friction against the guides. It offers two other advantages.

First, the facility of enabling one to place the trough or battery of the stampers at a certain distance from the axis of the wheel, which will give room for the workmen, and for more conveniently placing the necessary utensils.

Secondly, the stamping-trough may be placed higher, so that the emptying of the water and the pounded minerals may be performed on a floor raised above the axis of the wheel. One may even fix this trough in such a way, that the upper part of it shall be on a level with the bottom of the canal which brings the water upon the wheel. By this means we have the advantage of its whole fall, which would facilitate the making of canals and labyrinths where the pounded minerals might be deposited. This matter is of the more importance since we frequently experience the want of room to place a sufficient quantity of cisterns, to receive the sands and the vessels filled with the metallic matters, of which a considerable part by carrying to a distance is lost.

To remedy these defects, I propose the mode of construction represented in the plate.

Reference to Fig. 6, Plate XVI.

A A, section of the stamping trough or battery.

B, one of the stampers.

C C, guides to retain the stampers in a vertical position.

D, beam which by means of the chain L raises the stamper.

E, an iron-rod divided at the lower end to form a stirrup (I) to receive the cams F.

F, cams to raise the stampers, fastened to the axis of the wheel, the circumference of which is marked in dotted lines.

G G, two brass rollers which keep the stirrup in its vertical position.

H, one of these rollers seen lengthwise.

It will be perceived that by means of these rollers, the stirrup cannot be drawn towards, nor pushed from the cams, and that it is retained to its sides by the shoulders of the rollers.

Observations.

If the cams are of iron, it will be necessary to line the lower part of the stirrup M with a plate of brass, which will lessen the friction, or what is still better, fix a roller of that metal across the stirrup, as seen at K. In this case a little more length must be allowed to the stirrup.

When a longer or a shorter stroke is required to be made by the stamper, it is only necessary to fix the pivot which sustains the iron rod E into the upper or lower hole marked on the top of the rod.

In

In order that the weight of the rod shall not diminish the force of the stamper, it is essential that the weight of the sector of the beam D shall be sufficient to keep the rod in equilibrium. One may, according to circumstances, place the centre of motion of the beam nearer to the rod E, so as to obtain this equilibrium. It must be observed, however, that in this case the impulse which will be given to the beam, by the fall of the stamper, may raise the stirrup too high to be seized by the cams in its most convenient position. This inconvenience may notwithstanding be avoided, by fixing a flexible pole (as shewn at P) above the beam, against which it will strike.

Intelligence relating to Arts, Manufactures, &c.

(Authentic Communications for this Department of our Work will be thankfully received.)

The Cow-Pox, a Preventive of the Rot in Sheep.

THE benefits of the cow-pox to the human species are no longer called in question; they are universally acknowledged, while the examples of the real advantages of vaccination in sheep, attest its efficacy in preserving them from the destructive disease the rot.

An experiment of this kind was lately made near Lyons, on the domain of M. Flandres d'Espinay, who possessed two flocks which were kept separate, one of Merinos and the other of the ordinary French breed. That gentleman resolved to try the effect of vaccination in preserving his fine-woolled sheep from the ravages of the scab which prevailed in his neighbourhood, and had already extended its pernicious influence to his flock of the common

common breed. In this pressing danger he applied to the Veterinary School at Lyons, for intelligent pupils to inoculate his sheep of the pure breed with vaccine matter. The whole flock of Merinos was accordingly submitted to vaccination, which produced its effect in the usual time, and preserved the flock in the midst of the contagion without any other precaution.

Not satisfied with this result, M. d'Espinay placed forty of the sheep which had undergone the operation among the infected flock; but, though thus subjected to the influence of the disease, they withstood its attacks, while not one of those which had not been vaccinated escaped.

Use of Garlic against Moles.

Moles are such enemies to the smell of garlic, that, in order to get rid of these troublesome and destructive guests, it is sufficient to introduce a few heads of garlic into their subterraneous walks. It is likewise employed with success against grubs and snails.

New Preparation of Vinegar.

Take a cask made of oak, of a size proportioned to the quantity of vinegar required; this cask must have a bung about an inch and a half from the bottom, for the purpose of drawing off the liquor, but it must be set on one end to perform the operation. Rain or river water only can be used for this preparation; a quantity of either must be put into the cask equal to the quantity of vinegar required.

To thirteen quarts of water add half a pint of brandy, four ounces of tartar of wine, 12 ounces of sugar, and six of yeast. Reduce the tartar and sugar to powder, dissolve it in warm rain-water, adding the yeast, so as to

form

form a thick solution, which, being mixed with the brandy, must be poured into the cask, and the latter must be placed in a warm situation for about six weeks.

Before the cask is bunged up, the water, and other ingredients contained in it, should be shaken together, to mix them as much as possible. Half an hour is sufficient to render the mixture complete, after which it must be left in repose for the time specified. This vinegar, when drawn off into bottles and well corked, will keep a long time, and is not inferior to any vinegar hitherto known.

New Substitute for Coffee.

M. Dieudonné has discovered a substitute for coffee, in a substance which has hitherto been thrown away in great quantities, as of no use: this is the seed of gooseberries, after the expression of the juice; these are washed and dried, and afterwards roasted. When they come to be ground they have almost the exact smell of coffee, and are excellent when taken in the same way. Some of these seeds, kept six weeks by M. Dieudonné, still retained the smell of coffee. By mixing them with an equal part of real coffee, a liquor is produced, the taste of which does not differ at all from that of ordinary coffee.

Discovery of a new Species of Wheat.

M. de la Haye has announced that he discovered, during his travels, a species of wheat, a single grain of which in good earth produces a trunk with twelve to eighteen shoots. Each branch or shoot has a bunch, composed of ten or twelve ears, each ear containing from ten to twelve grains. M. de la Haye has made the Minister of the Interior acquainted with this discovery, and great advantage is expected to be derived from its cultivation.

Method

Method of purifying corrupted Water.

M. Deyeux lately made, at the School of Medicine, a public experiment on his filtres for clarifying and purifying water. A vessel was brought him containing water taken out of the kennel, and another filled from a tub in which carcases had been immersed upwards of three weeks. Having poured them upon his filtres, the water ran off in a few minutes perfectly clear, limpid, without taste or smell, equally bright and inviting as if it had distilled from the rocks.

The filtre used by M. Deyeux was only a large tin funnel, containing at the bottom a few pieces of glass, intended merely to support and prevent the pipe of the funnel from being choked by the small pieces of charcoal with which it was about two thirds filled. The charcoal was broken into small pieces of about two lines, or five cubic millimetres; it might even be broken still smaller, provided it was not reduced to powder, which might easily be prevented by passing it through a sieve. The other third part of the funnel was intended for the reception of the water.

List of Patents for Inventions, &c.

(Continued from Page 400.)

THOMAS ROWNTREE, of Great Surry-road, in the parish of Christ Church, in the county of Surry, Engine-maker; for a machine on an improved construction, for agitating and separating certain mixtures.
Dated March 23, 1804.

END OF THE FOURTH VOLUME, SECOND SERIES.

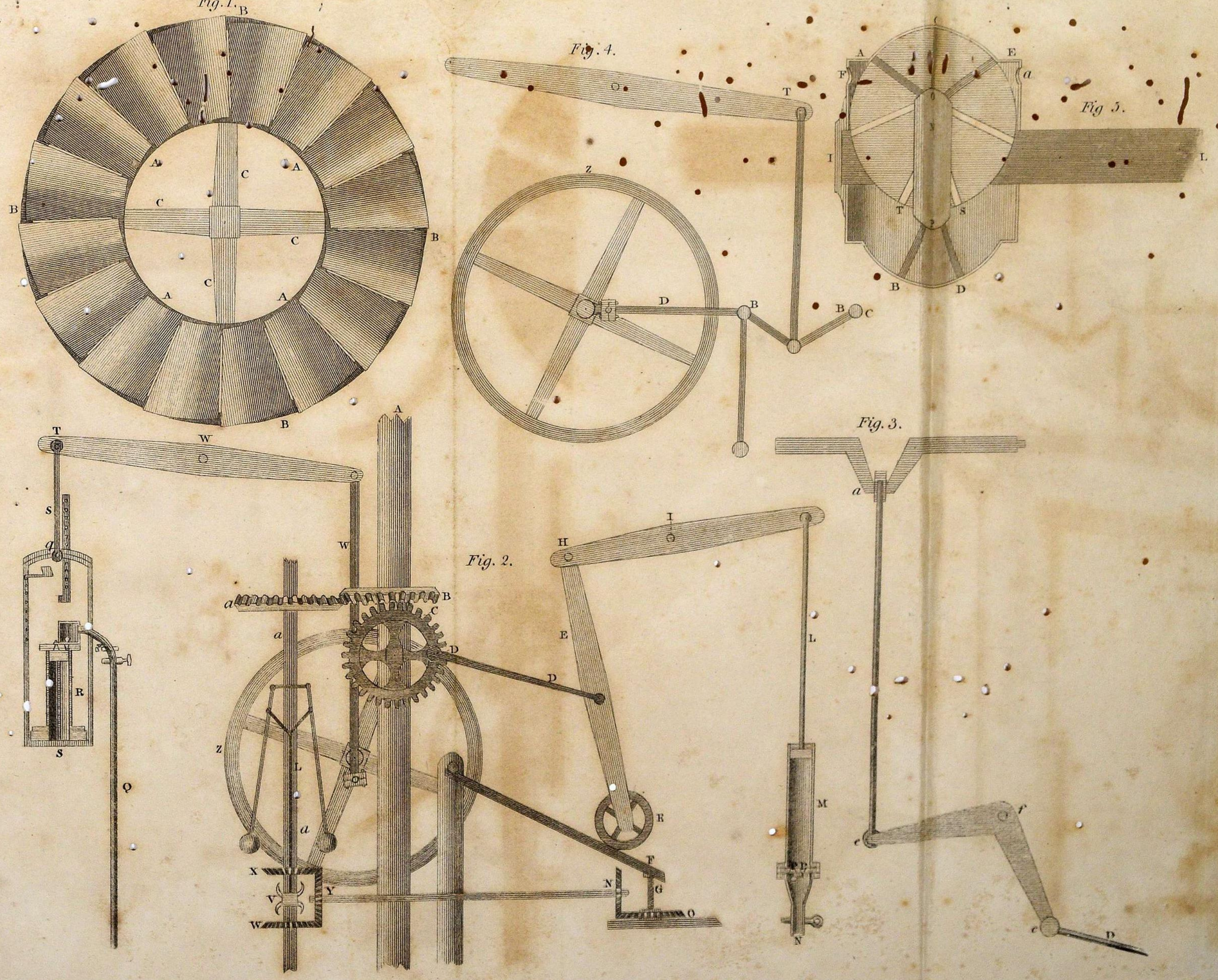
Fig. 1.
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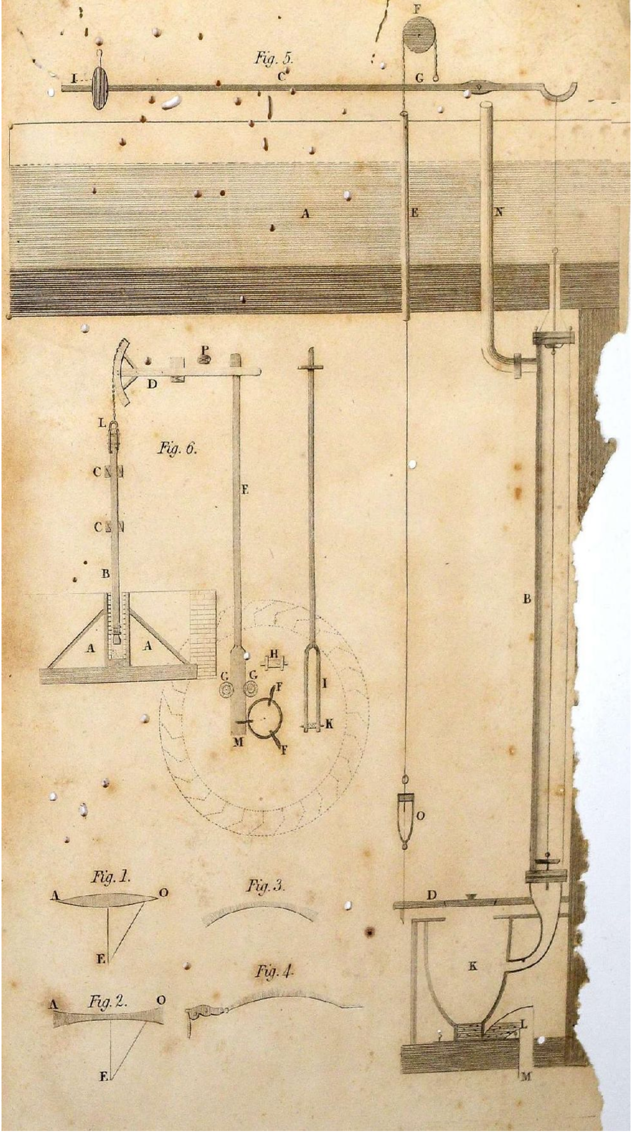
Fig. 5.
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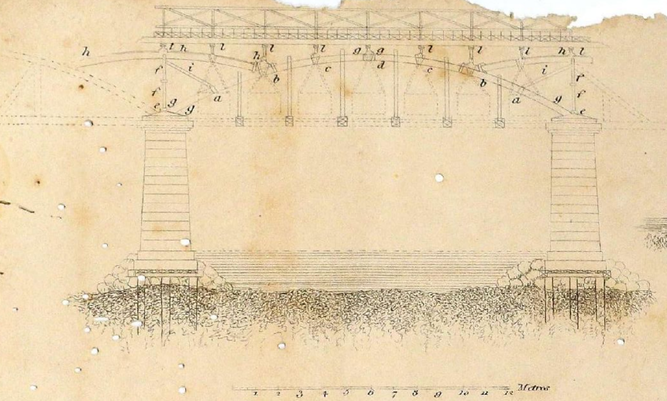


Fig. 4.

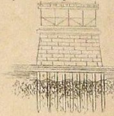
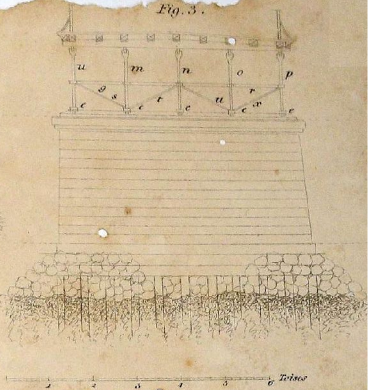


Fig. 3.



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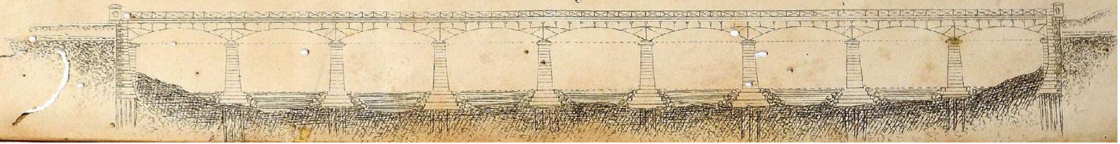

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Printed by NICHOLS and SON, Red-Lion-Paſſage, Fleet-ſtreet.